# EFFECT OF EARLY BED ACTIVITY TRAINING AMONG ACUTE HEMIPLEGIC SUBJECTS ON THEIR BASIC MOBILITY

## AN EXPERIMENTAL STUDY

Dissertation submitted to the Tamilnadu Dr. M.G.R. Medical University towards partial fulfillment of the requirements of **MASTER OF PHYSIOTHERAPY (Advanced PT in Neurology)** degree Programme.


**KMCH COLLEGE OF PHYSIOTHERAPY**

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# CERTIFICATE

This is to certify that research work entitled **"EFFECT OF EARLY BED ACTIVITY TRAINING AMONG ACUTE HEMIPLEGIC SUBJECTS ON THEIR BASIC MOBILITY- AN EXPERIMENTAL STUDY"** was carried out by the candidate bearing the Register No:**27101610**, KMCH College of Physiotherapy towards partial fulfillment of the requirements of the **Master of Physiotherapy (Advanced PT in Neurology)** degree course under the Tamil Nadu Dr. M.G.R. Medical University, Chennai-32.

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**INTERNAL EXAMINER**

**EXTERNAL EXAMINER**

Project Evaluated on:

*To my Grandfathers late Mr. Leslie H Noone and late Mr, M J Philip, who taught me, to share without expecting.*

*To my Grandmothers Mrs. Sara Philip, who taught me to love unconditionally, and Mrs. Victoria Noone who taught me to expect the unexpected.*

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# CONTENT

# *Abstract*

# ABSTRACT

**Objective:** To study the effects of early bed activity training on basic mobility among acute hemiplegic subjects. **Design:** pre and post test experimental study. **Sample size:**Twenty hemiplegic subjects. Age between 40 – 60 years.**Intervention:** both groups were treated with conventional therapy within 24-48 hours of post stroke, with early bed activity training started only for the experimental group and control group was started within $6^{th}$ or $7^{th}$ day post stroke. **Outcome measure:** STREAM scale- mobility component for motor recovery .**Results:** statistical analysis was done using the‘t’ tests, which showed a significant motor recovery in both the groups, the early bed activity group showing a significant improvement than the control group. **Conclusion:** Early bed activity training is a feasible and effective method in bringing about motor recovery in basic mobility among acute hemiplegic subjects.



**KEY WORDS:**

STREAM – Stroke Rehabilitation Assessment of Movement.

# *Introduction*

# 1. INTRODUCTION

This century is best addressed as the era of brain. Human brain was one of the areas which had the least amount of exposure till the last century. Cadaveric studies, better awareness of modern medicine and sterile procedures of surgery gave a tremendous leap in to the uncovered world of the most evolved but untouched realms of human brain.

To function properly the brain cells must have continuous supply of oxygen and other nutrients from the blood. When blood supply is disturbed even for few minutes, areas of the brain may be damaged and the person may suddenly lose some of the functions controlled by that region of the brain[1]. The world health organization (WHO) defines stroke as a "rapidly developing clinical signs of, a focal/global disturbance, of cerebral function, with symptoms lasting more than 24 hours or longer, or leading to death, with no apparent cause other than vascular origin". Stroke is the third leading cause for death in this world. It is also one of the leading causes for severe handicap in the world.

Stroke aetiology is divided into ischemic (90%) and hemorrhagic (10%). Of ischemic stroke, the thrombotic type is the most common, followed by embolic and lacunar types, respectively.

Stroke induces not only a region of cell death and scar formation, but regions of neural repair and reorganisation[45]. It is well established that stroke survivors have low levels of physical fitness and muscle strength that impact on their ability to perform everyday activities and affect their independence and community participation. Physical inactivity after stroke has many negative sequel that may impact upon potential reorganization of brain function and on recovery of motor abilities. There is greater awareness now, of the need for patients to practice every day actions intensively, in order to regain skill in motor performance. However, it is only recently that interest has turned to the physiological effects of inactivity in bringing about a reduction in aerobic capacity and physical endurance and to the effect of this deconditioning on an individual's capacity to raise the energy levels in motor training that are necessary to improve functional performance and brain reorganization[20.]

Stroke rehabilitation is an area in which even now there are debuts regarding the time and type of commencing the rehabilitation. Treatment in a stroke unit (compared to treatment in a general medical ward) reduces the odds of being dead or disabled at 12 months post stroke[41]. However relatively little is known about which components of acute stroke unit care may be responsible for better outcomes[25, 24]. It becomes a difficult task for physiotherapists to know when to start the basic mobility training and also to which patients the training to be administered.

Bent Indredavik et al (2007) stated that mobilization is defined as out of bed activity and the word ‘early’ is defined as the first week after onset of stroke symptoms and ‘very early’ as within 24 to 48 hours after symptom onset[18]. Hence the term bed activity training is used to address the individual component of ‘mobilization’ which is confined only to movement and transfers within the bed.

# 1.1 NEED FOR THE STUDY

In stroke the subjects undergo paralysis and there by become dependent on their basic activities. It becomes devastating for the patients when they realize they are not able to even turn on the bed, independently. Also prolonged bed rest poses severe complications later in therapy and also Quality of life. Stroke survivors have reduced levels of fitness and strength that has a great impact on their ability to perform basic activities and affect their further independence and community participation[20]. Hemi paretic stroke patients, at an early stage are able to somehow initiate or complete their basic bed activities, like turning, side lying, bridging, and coming to sit and also transfers within the bed. But things become difficult when the patients are totally paralyzed like in the case of hemiplegia. Most of the hemiplegic patients fail to initiate these basic movements, not because of complete inability, but because of lack of awareness. Hence we chose to experiment our research in acute hemiplegic stroke patients.

Bed activity training is the initial component of early mobilization. Also it is not known which component of acute stroke care is responsible for better outcome[25, 24.] Hence it is necessary to find out the effect of each component in mobilization to specifically categorize the outcome. Early mobilization is a term used to describe the training given to patients to move in the bed, transfer in and out of the bed and to move away from one place to another[8].Training the basic bed activities to hemiplegic subjects give them a better outcome later on in their therapy and also to initiate the near normal pattern of movements at an early stage. Most of the hemiplegic subjects learn to do these activities on their own and result in completely abnormal and deviated patterns of movement. These wide abnormalities they learnt, becomes a great hindrance in the further therapy sessions. So it is necessary to train bed activities to the hemiplegic subjects at an early stage and find out if this training is effective in their basic mobility or not.

So in this study an effort has been made to analyze the effect of training basic bed activities for acute hemiplegic subjects and its effects on their basic mobility.

# *Review of literature*

# 2. REVIEW OF LITERATURE

## 2.1 STROKE

**Rowan Harwood et al (2005)** defined stroke as a rapidly developing episode of focal (or) global neurological dysfunction lasting longer than 24 hours (or) leading to death and presumed vascular origin.

**WHO (2003)** states that stroke presents a major global public health challenge, with 5.5 million people dying from stroke each year[48].

**Wolfe (2000)** states that stroke is one of the commonest conditions were more than 7.8 million people live with chronic disability[49].

**Arthur Anconitz et al (1993)** defined stroke as a loss of functioning brain tissue, with an accompanying disability, such as weakness, paralysis, blindness, (or) speech impairments. Stroke is triggered by deprivation of blood to part of brain

## 2.2 INCIDENCE

Stroke incidence rises rapidly between the age group of 45-65 years with similar gender variability and increases rapidly after 65 years with increasing variability found in males than females with the ratio of 3:1[4,37].

## 2.3 ARTERY INVOLVEMENT

On the basis of pathology stroke can be classified as

- Thrombotic
- Embolic
- Hemorrhagic

Approximately 83% of strokes are due to ischemic cerebral infarction and 17% due to brain hemorrhage[11].

## 2.4 MOTOR RECOVERY AFTER STROKE

**Tarasova et al (2008)** did a study in which ninety six patients were examined before and after complete rehabilitation, and measure of functional disablement, functional disorder, and quality of life also tested. Results proved that intensive rehabilitation in the acute phase of stroke to an improvement of the functional state and a reduction of measure of the impairment of motor and cognitive function[45].

**Klein et al (2007)** concluded that in the early phase following stroke, there is prompt initial improvement in function as the pathologic processes associated with penumbra- ischemic metabolic injury, edema, hemorrhage, and blood pressure resolve. The later ongoing improvement involved is termed as reorganization that represent neuroplasticity. It is recognized that repeated participation by patients in active physical therapeutic programs probably provides direct influence on the process of functional reorganization in the brain and enhances neurologic recovery.

**Nick et al (2004)** demonstrated that in brain with lesions, it is likely, that surviving elements of highly preserved neural systems, such as those sub serving motor shill learning, will be engaged to maximize functional motor recovery. He concluded that the degree to which mechanisms underlying cerebral reorganization depends on the functional integrity of the remaining areas. The chronicity of stroke may also be important, as early lesion induced cortical hyper excitability seems to facilitate cortical plasticity[29].

**Kwakkel et al (2004)** suggested that the restitution of non infracted penumbral areas assumes that affected cerebral tissues has just enough energy to survive for a short period of time but not enough to communicate and function. As the neurons in the penumbra are still structurally intact and capable of re- functioning, they are believed to intervene in the acute phase in order to limit the infracted area. Irreversible cerebral tissue damage after arterial occlusion is difficult to match with the long term recovery pattern observed even beyond the first 6 months post stroke[23].

**Gaocong et al (2001)** stated that early rehabilitation training of the patients with hemiplegia may obviously improve motor function of upper and lower limbs and raises ADL scores[17].

**Shelton et al (2001)** suggested that neuronal dysfunction due to ischemic penumbra surrounding an area of infarction magnifies the apparent clinical severity of the stroke. Neuronal recovery in ischemic penumbra explains the rapid improvement of neurological impairment over the first several days post stroke[13].

**Peurunnen et al (2000)** suggested that early after stroke, the homeostatic environment around an area of infarction is enriched in growth factors; alter transmitter receptors and other trophic processes. This could support the formation of synapses or enhancement of dendritic arborization and it is possible that these processes occurring early may play a disproportionate role in recovery[35].

**Catherine et al (2000)** concluded that during the early rehabilitation following stroke, subjects who were admitted to stroke unit and also received daily rehabilitation therapy for up to eight weeks exhibited improvement in postural sway and activities based range of balance.

**Seitz et al (1999)** concluded that motor recovery after cortical infarction in the MCA territory appears to rely on activation of pre motor cortical areas of both cerebral hemispheres. There by, short term output from motor cortex is likely to be initiated[44].

**Striemer et al (1995)** suggested that the resolution of diaschisis is a potential confounding factor when assessing the relation between lesion location and subsequent motor recovery after stroke. It resolves with time and responses to environmental stimulation and to the action of monoamine antagonists[43].

**Gereon et al (1999)** in their study used positron emission tomography to study the functional reorganization of motor and sensory system in hemiplegic stroke patients, before motor recovery. Regional cerebral blood flow(r CBF) was measured in six hemiplegic patients with single sub cortical infarct. Results shows changes of cerebral activation in sensory and motor system occur early after stroke and may be a first step forward in restoration of motor function following stroke[16].

**Frederic et al (1970)** concluded that there is no contraindication to early initiation of rehabilitation and those patients whom initiated immediately after stroke have the most rapid and optimal recovery, 90% - 95% of hemiplegics got good return of function in upper extremity, 65% of patients became independent in self care and ambulation[15].

**Hayes and Corroll (1986)** suggested that early ambulation have shown to reducing mortality, earlier return of mental and motor function and activity of daily living.

**Bobath B (1978)** stated that early training of activities in bed and out of bed brings about a great improvement in the functional ability of stroke patients[6].

## 2.5 EARLY REHABILITATION

**Asberg (1989)** in a quasi randomized trial on orthostatic tolerance training of stroke patients in general medical wards, concluded that early during stroke the orthostatic tolerance of stroke patients were much reduced and movements in bed and out of bed and further mobilization had improvement in their orthostatic tolerance.

**Janet H Carr and Roberta B Shepherd (2011)** in their review article stated, that early rehabilitation (bed activities, getting out of bed in to sitting, standing up and walking) is now recommended in a number of clinical guidelines for acute stroke[31].

**J H Carr and R B Shepherd(2010)** stated that the ability to move in bed, stand up and sit down is critical to the rehabilitation process, and biomechanical principles provide guidelines to reducing the effort required to stand up in the early stages of mobilization[20].

**Dean et al (1992)** in their study stated that balance impairment in sitting is common after stroke. This disability is resulting from not only neural lesion such as weakness, loss of coordination, but also tendency to adapt behavior to avoid the threat to balance. More than 70% of stroke patients admitted to rehabilitation are unable to reach side ways to floor while sitting.

**Bernhardt J (2008)** stated that loss of strength of as much as 40% has been reported within first week of immobilization, and the antigravity muscles of calf and back, needed for standing up, shows visible atrophy at a faster rate than non gravity muscles[7].

**Sinikka et al (2007)** revealed that active training needs to be initiated promptly after stroke, 2 to 8 days of post stroke to promote cortical reorganization and achieve better functional benefits[43].

**Fabienne et al (2001)** emphasized the concept of primary post stroke fatigue , which may develop in the absence of depression (or) significant cognition sequel , and which may be linked to intentional deficits resulting from specific changes to reticular formation and related structures involved in sub cortical net work. In patients with excellent neurological and neuropsychological recovery, post stroke fatigue may be the only persistent sequel, which may severely limit their return to previous activities.

**Indredavik (2008)** conducted a study on the impact of early mobilization on physiological variables for acute stroke individuals. The results showed that majority of subjects were able to sit out of bed for 55 minutes in first day of stroke with small transitory increase in blood pressure, heart rate and sustained improvements in consciousness and oxygen saturation[19].

**Adams (2003)** stated that early bed activity training followed by out of bed mobilization should be incorporeated in to internationally accepted guideline standards of early management of stroke[3].

## 2.6 AFFECT OF MOTOR IMPAIRMENT ON DISABILITY

**Patel et al (1998)** performed a study with the aim of assessing the relationship between impairment and functional outcome. Mobility and ADL were assessed at 1, 3, and 6 months post stroke by using functional independence measure, Barthel index, Lawton instrumental ADL. The cumulative deficits post stroke affect patients functional outcome in the first six months[33].

**Nancy et al (1999)** did a study with the purpose to describe the disabilities experienced by a person with stroke during the first year and explore the evaluation of impairment, disability, handicap and health related quality of life. They suggest that much of the improvement in impairment and disability occurs during the first month and then reaches a plateau. Handicap and quality of life continue to be an issue later[31].

**Kenneth et al (2001)** in their study measured motor and cognitive abilities by FMA (Fugl-Meyer assessment) and neurobehavioral cognitive status examination and functional performance was measured by FIM assessment was conducted at admission, after two weeks and at discharge. The results from this study, motor impairment, balance, lower limb ability, strongly accounts for functional recovery in rehabilitation of patients with stroke staying in hospital[23].

**Farhan et al (2005)** did a study of 100 patients with ischemic stroke and was assessed at neurology department. River mead motor assessment was used to measure motor impairment and functional independence measure (FIM) to measure disability. The baseline and post stroke values were taken on seventh day, tenth day and three months. They concluded that stroke related motor impairment and disability had a significant correlation with each other[14].

**Chae et al (2005)** in this study they investigated the motor impairment and physical disability, using Fugl- Meyer motor impairment scale and FIM. Forty eight patients were admitted to rehabilitation within six weeks of stroke onset. They suggested that physical activity dependency on daily living after stroke primarily depends on the degree of motor impairment[9].

**Masiero et al (2007)** had done a study to investigate the predictive factors for ambulatory recovery in stroke patients undergoing rehabilitation. Functional status at admission and discharge was evaluated by FIM and its motor component, upper and lower mobility index, and trunk control test. Results indicate that age and level of motor and functional impairment measure at baseline are significant predictors of ambulatory outcome[27].

**Ashburn A (1982)** stated in his study that the motor impairment in stroke subjects can be detrimental if they are not addressed at a very early stage. He also stated that the ability of a person to improve also depends on the guidance which is available for him in the acute stage[2].

## 2.7 STREAM SCALE – BASIC MOBILITY COMPONENT

**KathyDaley et al (1999),** in their study found out the reliability of the STREAM score. They found that it has high inter rater and intra rater reliability (alpha coefficient for the mobility subscale was 0.965 and 0.979 for each limb subscales). The overall alpha coefficient for the STREAM measure was 0. 984[12].

**Gather et al (2003)** in their study on 24 stroke patients used the STREAM sub scales of limbs to assess the motor recovery in acute subjects after a rehabilitation trial on motor relearning program.

**Aramdt et al (2006)** did a study to compare the effects of motor relearning program with that of Bobath approach and had used STREAM as one of the outcome measures. They stated that this can be used an effective measure to evaluate the motor recovery in early stages of stroke.

**Nancy mayo** has stated that the stream scores of 1a, 1b, and 1c can be considered as 1, for all the statistical purposes and the a, b and c are given, so as to help the therapists to assess, plan and treat the patients

# *Aim and objectives*

# 3. AIM & OBJECTIVES

## 3.1 AIM:

To study the effect of early bed activity training on basic mobility among acute hemiplegic subjects.

## 3.2 OBJECTIVES:

- To evaluate the effect of early bed activity training started within 24 – 48 hours following stroke, in hemiplegic subjects.
- To initiate early movement within bed for hemiplegic patients in acute stage.
- To evaluate the effect of early bed activity training on basic mobility of acute hemiplegic subjects.
- To implement the technique in to clinical practice.

# *Materials and methodology*

# 4. MATERIALS AND METHODOLOGY

## 4.1 STUDY DESIGN:

Pre and post test experimental study design.

## 4.2 STUDY POPULATION:

Acute Middle Cerebral Artery hemiplegic subjects.

## 4.3 STUDY SETTING:

Kovai Medical Centre and hospital,Coimbatore.

## 4.4.SAMPLE SIZE:

20 subjects with acute ischemic Middle Cerebral Artery stroke.

**Group I:** 10 subjects (bed activity training started between 24- 48 hours of stroke onset)

**Group II:** 10 subjects (bed activity training started within $6^{th}$ or $7^{th}$ day of stroke onset)

## 4.5. SAMPLE TECHNIQUE:

Purposive sampling

## 4.6CRITERIA FOR SELECTION OF PATIENTS:

### 4.6.1. INCLUSION CRITERIA:

1. Age 40-60
2. Genders – both male and female
3. Middle cerebral artery ischemic stroke
4. Admitted within one day of post stroke.

5. Medically stable, confirmed by a neurologist.
6. No voluntary control on the affected side – Brunnstrom stage 1(Appendix IV).
7. Dynamic sitting balance score- poor (functional balance scale) Appendix III.
8. Should react to verbal commands.

### 4.6.2 Exclusion criteria:

1. Hemorrhagic stroke
2. Musculoskeletal impairments
3. Acute coronary syndrome
4. Progressive neurological disorder
5. Severe heart failure
6. Cognitive impairment
7. Medically unstable
8. Visual and auditory impairment
9. Posterior Cerebral Artery & Anterior Cerebral Artery stroke
10 Unstable angina
11 Previous episodes of stroke

## 4.7 HYPOTHESIS

### 4.7.1 NULL HYPOTHESIS:

**$H_{01}$-** There is no significant improvement in basic mobility with early bed activity training started within 24- 48 hours of stroke onset in acute hemiplegic subjects.

**$H_{02}$-** There is no significant improvement in basic mobility with bed activity training started within $6^{th}$ or $7^{th}$ day of stroke onset in acute hemiplegic subjects.

**$H_{03}$-** Thereis no significant difference existing between bed activity training started within 24-48 hours of stroke onset and bed activity training started within $6^{th}$ or $7^{th}$ day of stroke onset on basic mobility of acute hemiplegic subjects.

### 4.7.2 ALTERNATE HYPOTHESIS:

**$H_{A1}$-** There is significant improvement in basic mobility with early bed activity training started within 24- 48 hours of stroke onset in acute hemiplegic subjects.

**$H_{A2}$-** There is significant improvement in basic mobility with bed activity training started within $6^{th}$ or $7^{th}$ day of stroke onset in acute hemiplegic subjects.

**$H_{A3}$-** There is significant difference existing between bed activity training started within 24-48 hours of stroke onset and bed activity training started within $6^{th}$ or $7^{th}$ day of stroke onset on basic mobility of acute hemiplegic subjects.

## 4.8 STUDY METHOD

## 4.8.1 PROCEDURE:

A written consent (Appendix I) was taken from patients who fulfilled the inclusion and exclusion criteria. Pre test was taken with the STREAM scale mobility component for motor recovery. Subjects were allocated in to two groups. Patients in group 1 received physical therapy with early bed activity training started 24-48 hours of stroke onset. Patients in group 2 received conventional physical therapy with bed activity training started within $6^{th}$ or $7^{th}$ day of stroke onset. Post test was taken after two weeks with the same outcome measure.

## 4.8.2CONVENTIONAL THERAPY:

**Electrical stimulation:**

Electrical stimulation was given to upper and lower limb muscles.

- Type of current – Faradic current.
- Pulse duration – I ms.
- Pulse frequency – 50Hz.
- Pulse amplitude – sufficient enough to achieve desired strength of contraction.
- Muscles – Triceps, wrist and finger extensors, dorsiflexor of ankle.
- No. of contraction – based on response of muscle in order to avoid muscle fatigue.

**Normalization of tone:**

- Slow sustained stretching of biceps and wrist flexors, hamstrings and calf.
- Quick icing techniques to facilitate tone of biceps and quadriceps.
- Upper limb weight bearing position in long sitting.

**Range of motion exercises:**

- Passive movements and active assisted exercise for the affected upper and lower limb.

## 4.8.3 BED ACTIVITY TRAINING[55].

All exercises were done with assistance in the initial days and gradually reducing assistance as the patient improves.

**I Supine position**

Rolling to affected side

Position- supine with uninvolved hip and knee on the bed and unaffected shoulder extended

Action – extend hip and knee and hyperextend the shoulder joint, rotate head to the side of the turn.

**II Moving on the bed**

Position – same as above

Action- extends the hip, knee, shoulder and head, pushing on the mat moving toward the feet.

**III Pelvic tilter**

Position- supine with lower limbs extended

Action- flattens and arches the low back

**IV Prone position**

Position – prone on elbows and forearms

Action- shift weight from elbow to elbow, lift and reach with free arm.

**V Rolling from supine to side (turning to affected slides)**

1. Flex non affected hip and knee, keeping foot flat on mattress
2. Hold both the arms together
3. Push against mattress with non affected foot
4. Turn (with help initially) to the affected side.

(It should be noted that any improvement in movement in the affected side was utilized, in these activities for assistance and facilitating the use of the affected side)

**VI Moving in bed – back and front and lateral sides**

1. Long sit with arms at back ( with support of the affected side)
    a. Flex both hips and knees
    b. Push against the mattress and move back and sides(with help initially)

**VII Coming to sitting position**

1. From side lying position( on the non affected side)
2. Abduct and extend non affected arm until weight is on the forearm
3. Hook non affected foot around affected ankle(if there is any movement in the affected leg that was utilised for the activity)
4. Flex non affected hip and knee carrying affected hip and knee along in to flexion
5. Extend non affected elbow until weight is on hand
6. Walk non affected hand toward hips, coming to sitting position
7. Legs off the edge of the bed

**VII Weight shifts (sitting balance)**

1. In sitting, the patient was asked to shift weight to both sides.
2. By lifting the unaffected hand the patient was asked to weight shift alternating between the both sides.

**IX Sit to stand**

Patient was made to stand with the help of two therapists at the beginning, by holding the affected knee from buckling and gradually reducing the support at the knee. (Initially patient was made to stand for 2 to 3 minutes and gradually increased the time to 5 to 10 minutes depending on the improvement and also on the tolerance of the patient).

Assisting to turn to the intact side

Supine to sitting

Assisting to high sit

Moving sideways to the affected side

**REPETITION:** 10-15 Repetitions for 14 days (two weeks).

**TREATMENT DURATION:** 1 hour excluding rest period.

**NO. OF SESSION:** 2 times per day for two weeks (14 days).

## 4.9 OUTCOME MEASURE:

Basic mobility-**Stream scale** – Mobility component (Appendix II)

**Pre test** was measured on the first day of assessment before treatment (within 24 – 48 hours for experimental group and within $6^{th}$ or $7^{th}$ day for control group).

**Post test** was measured on the $14^{th}$ day after treatment. (For both the groups)

## 4.10 STATISTICAL ANALYSIS[54,56,]:

Pre test and post test values of the study was collected and was assessed for variation in improvement & their results was analysed using independent 't' test and and paired 't' test.

- INDEPENDENT `t' TEST (between groups)

$$t = \frac{\overline{X1} - \overline{X2}}{S}\sqrt{\frac{n_1 n_2}{(n_1 + n_2)}}$$

Where,

$$S = \sqrt{\frac{\sum d_1^2 + \sum d_2^2}{n_1 + n_{2-}2}}$$

- PAIRED `t' TEST (within groups)

$t = \frac{\bar{d}\sqrt{n}}{S}$ Where,

$\mathbf{S} = \sqrt{\frac{\sum \boldsymbol{d^2} - [\bar{\boldsymbol{d}}]^2 \times \boldsymbol{n}}{\boldsymbol{n-1}}}$

S=combined standard deviation

$d_1$&$d_2$ =difference between initial & final readings in group A &group B respectively.

$n_1$&$n_2$=number of patients in group A & group B respectively.

$\overline{X_1}$&$\overline{X_2}$ =Mean of group A & group B respectively.

Level of significance: 5%.

# *Data presentation*

# 5. DATA PRESENTATION

## 5.1 TABULAR REPRESENTATION

### TABLE 1: PAIRED‘t’ TEST

### GROUP I – EXPERIMENTAL GROUP

| SCALE | MEAN VALUES | | Calculated ‘t’ value | Table ‘t’ value | Level of significance |
|---|---|---|---|---|---|
| | PRE TEST | POST TEST | | | |
| STREAM SCALE-MOBILITY COMPONENT | 2.7 | 16 | 29.657 | 2.262 | 5% Significant |

### TABLE 2: PAIRED‘t’ TEST

### GROUP II: CONTROL GROUP

| SCALE | MEAN VALUES | | Calculated ‘t’ value | Table ‘t’ value | Level of significance |
|---|---|---|---|---|---|
| | PRE TEST | POST TEST | | | |
| STREAM SCALE-MOBILITY COMPONENT | 2.6 | 13.6 | 14.201 | 2.262 | 5% Significant |

## TABLE 3: INDEPENDENT‘t’ TEST

## PRE TEST VALUES: GROUP I AND GROUP II

| SCALE | MEAN VALUES | | Calculated ‘t’ value | Table ‘t’ value | Level of significance |
|---|---|---|---|---|---|
| | GROUP I | GROUP II | | | |
| STREAM SCALE-MOBILITY COMPONENT | 2.7 | 2.6 | 0.184 | 2.101 | 5% Not significant |

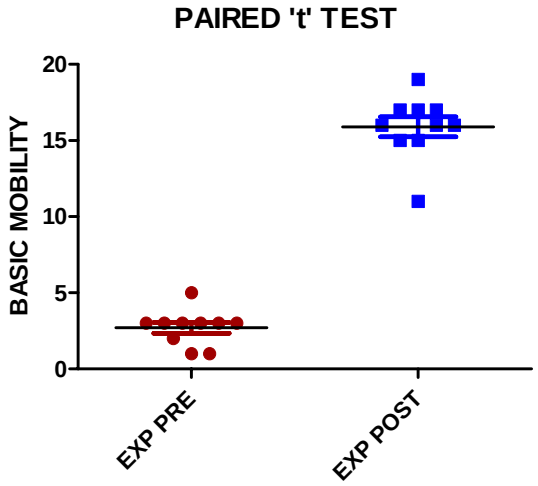
## TABLE 4: INDEPENDENT‘t’ TEST

## POST TEST VALUES: GROUP I AND GROUP II

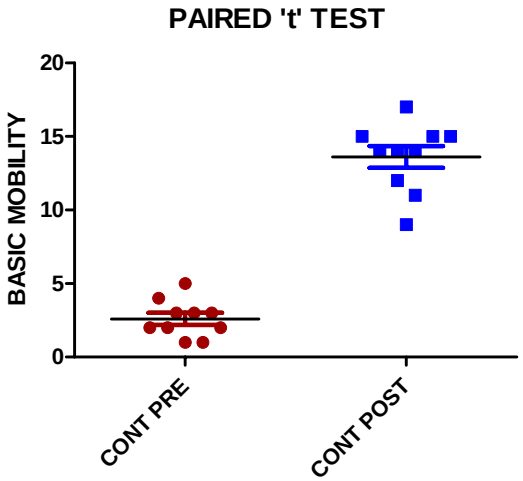
| SCALE | MEAN VALUES | | Calculated ‘t’ value | Table ‘t’ value | Level of significance |
|---|---|---|---|---|---|
| | GROUP I | GROUP II | | | |
| STREAM SCALE-MOBILITY COMPONENT | 16 | 13.6 | 2.422 | 2.101 | 5% Significant |

# 5.2 GRAPHICAL REPRESENTATION

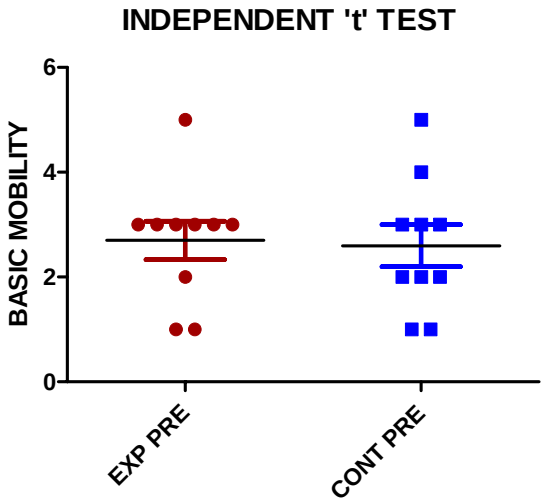
## GRAPH 1: PRE AND POST TEST VALUES AND MEANS OF STREAM SCALE – MOBILITY COMPONENT IN EXPERIMENTAL GROUP



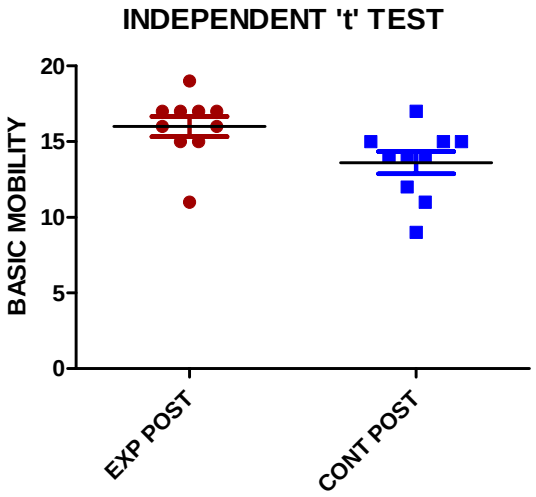

## GRAPH 2: PRE AND POST TEST VALUES AND MEANS OF STREAM SCALE- MOBILITY COMPONENT OF CONTROL GROUP.



**GRAPH 3: PRE TEST VALUES AND MEANS OF STREAM SCALE-MOBILITY COMPONENT OF EXPERIMENTAL AND CONTROL GROUP.**




**GRAPH 4: POST TEST VALUES AND MEANS OF STREAM SCALE-MOBILITY COMPONENT OF EXPERIMENTAL AND CONTROL GROUP.**



# 5.3 DATA ANALYSIS AND RESULTS

## PAIRED‘t’; TEST:

## GROUP I: EXPERIMENTAL GROUP

## STREAM SCALE- MOBILITY COMPONENT

For 9 degrees of freedom and at 5% level of significance, the table‘t’ value is 2.262 and the calculated ‘t’ value is 29.657. Since the calculated‘t’ value is greater than the table‘t’ value the null hypothesis is rejected. Thus there is a significant improvement in basic mobility with early bed activity training started within 24 – 48 hours of post stroke in hemiplegic subjects.

## GROUP II: CONTROL GROUP

## STREAM SCALE MOBILITY COMPONENT

For 9 degrees of freedom and 5% level of significance the table‘t’ value is 2.262 and the calculated ‘t’ value is 14.201. Since the calculated‘t’ value is greater than the table‘t’ value the null hypothesis is rejected. Thus there is a significant improvement in basic mobility with bed activity training started within $6^{th}$ or $7^{th}$day post stroke in hemiplegic subjects.

## INDEPENDENT‘t’ TEST:

## PRE TEST VALUES: GROUP I AND GROUP II

## STREAM SCALE – MOBILITY COMPONENT

For 18 degrees of freedom and 5 % level of significance, the table‘t’ value is 2.101 and the calculated ‘t’ value is 0.184. Since the calculated‘t’ value is lesser than the table‘t’ value the null hypothesis is accepted. Thus there is no significant difference existing between the pre test values of the two groups, the homogeneity being maintained.

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## INDEPENDENT‘t’ TEST:

## POST TEST VALUES: GROUP I AND GROUP II

## STREAM SCALE – MOBILITY COMPONENT

For 18 degrees of freedom and 5% level of significance, the table‘t’ value is 2.101 and the calculated ‘t’ value is 2.422. Since the calculated‘t’ value is more than the table‘t’ value the null hypothesis is rejected. Thus there is a significant difference existing between the post test values of the two groups and hence the experimental group showed better improvement in basic mobility after the early bed activity training.

# *Discussion*

# 6. DISCUSSION

Stroke is considered to be one of the leading causes of disability in society as about 30% to 50% of patients who sustain a stroke are left with considerable residual deficits. 57% of subjects with stroke developed moderate to severe disability at the time of discharge, the disabilities are due to medical complication and motor impairment caused by loss of mobility and activities of daily living.

Functional limitation is one of the main disabilities due to motor dysfunction in the acute phase of stroke. Inability to do their basic needs and the realization that they cannot move in bed on their own, leads the hemiplegic patients in to state of depression. So it becomes necessary for the medical team (physician, nurse, or therapist) to make the patient as independent as possible, as early as possible. The early activation and transition of patients as quickly as possible in to more intensive rehabilitation, minimize complications, accelerate recovery and improve ultimate outcome.

This study was conducted on 20 acute hemiplegic patients where 10 patients were allocated to the experimental group and had given early bed activity training within 24 – 48 hours post stroke, along with conventional therapy and other 10 was given conventional therapy but started bed activity training within $7^{th}$ to $10^{th}$ days post stroke (2 sessions per day). Results were analyzed with STREAM scale- mobility component. Statistical analysis was done with paired‘t’ test and independent‘t’ test.

On statistical analysis of STREAM scale using paired‘t’ test there was a significant improvement of basic mobility in both control and experimental groups. On analyzing 2 groups using independent‘t’ test the experimental group had a higher improvement in motor recovery of basic mobility. This significant improvement in the experimental group may be due to earlier training which would have facilitated early activation of muscles.

In control group improvement was present, not as much as for the experimental group, especially in stepping and walking activities. This may be due to the fact that the early group had early muscle activation compared to the late group.

The scores on the STREAM scale were satisfactory and the scores which consistently showed improvement were the side lying, bridging and the coming up to sit.

The results might be due to two reasons. One, the development of impairments which exists earlier. It is caused by the involvement o f the upper motor neuron, its pathway and connections. They are weakness, abnormal muscle activation, and tone changes, abnormal reflexes and disordered motor control. Lower extremities lose their strength about twice as fast as upper extremity muscles. Bernhardt J (2008) found out that, loss of as much as 40% has been reported within the first week of immobilization, and the antigravity muscles of the calf and the back, needed for standing up, become visible to atrophy at a faster rate than non antigravity muscles[7]. These impairments got better with the early intervention. So bed mobility training should be started as early as possible, and before any impairment is apparent. Sinikka (2007) et al, revealed that active training to be initiated promptly after stroke, 2 to 8 days post stroke, to promote cortical reorganization and achieve better benefits.

Another important reason is development of deconditioning which is due to bed rest in post stroke. Patients in control group had reduced exercise tolerance and became easily fatigued at relatively low levels of exercise during therapy sessions. They had much reduced endurance to actively participate in the rehabilitation programme. Two subjects developed giddiness due to orthostatic hypotension which may be one of the reasons for inactive participation for rehabilitation. Fabienne et al (2001) emphasized the concept of primary post stroke fatigue, which may develop in the absence of depression (or) significant cognition sequel, and which may be linked to intentional deficits from specific changes to reticular formation and related structures involved in the sub cortical net work. In patients with excellent neurological and neuropsychological recovery, post stroke fatigue may be the only persistent sequela, which may severely limit their return to previous activities.

While analysing the individual scores it was observed that 4 patients in the control group had got post test scores similar to that of the experimental group. This shows that other factors like motivation of the patient, extent of lesion (the smaller the lesion the better the prognosis) would have played a role in improving the recovery even in patients started late. It was also observed that the patients in experimental group consistently showed improvement in their scores.

Early training is recommended in a number of clinics[31]. But early during hemiplegia not all clinics start the rehabilitation. Instead they wait till some improvement in voluntary motor power. This makes the patient go in to a state of deconditioning[7] and hence causes a reduced ability to exercise tolerance and there by affecting further rehabilitation. Also early activity facilitates muscle activation and thereby causes a better improvement.

Basic activity training is very important in the early stages of strokethan individual muscle training, because of the fact that the brain learns need based motor activities than the isolated activities. It means that the brain learns a need based activity, like side lying, sitting, drinking water from glass, than movements like trunk rotation, elbow flexion. But it is necessary in the early stages to utilise the available range and need based activities. There has been a transition from individual muscle strength training to need based training. The advent of motor relearning techniques and functional rehabilitation has contributed to a great extent to the importance of training patients in their available range for the need based activites.

In this study it was proved that the early bed activity group had a consistent improvement in their basic mobility compared to that of the late group. This shows that the experimental group subjects had a better exercise tolerance (not assessed objectively in this study) and better early muscle activation of the paralysed side. When early activity in bed is done, there is reorganisation happening at the cortical level, to the neurons which are damaged and neural plasticity happens. This has been proposed for the improvement and natural recovery in stroke patients. When we do bed activities early during stroke, the brain rearranges itself to the need based activity. In the acute stage the most necessary activity for stroke patients is the bed activities because they are paralysed on one side. Most of the patients at this stage do not realise that they are able to turn. This lack of awareness leads to more prolonged immobility and complications following that. Hence it is necessary to initiate early activity in stroke.

In this study it was observed that most of the patients were able either to initiate side lying with help, or to raise their hips, with a grossly deviated pattern from the normal. It is then that they realise they can do these activities or movements. The subjects in the control group showed better ability to do more repetitions of exercises two times a day, compared to those subjects in the control group. This showed that the early bed activity training group showed a better exercise tolerance and high fatigue threshold.

Most of the studies done on early rehabilitation were on hemiparetic subjects, but in this study we have tried to find out the effects of early bed activity training on hemiplegic subjects. It is also important not to teach the patients a compensatory strategyat the very early stage. Even though, in this study, during the initial days following hemiplegia, patients were taught to do the bed activities using a compensatory strategies, but was always on the look out to facilitate the affected side and utilise its improvement in the bed activities and also in the further rehabilitation.

# *Summary and conclusion*

# 7. SUMMARY AND CONCLUSION

The aim of this study was to find out the effect of early bed activity training on basic mobility among hemiplegic stroke subjects. Twenty acute hemiplegic subjects were selected by purposive sampling method in which ten of them underwent early bed activity training with conventional therapy and the other ten subjects with training given within $6^{th}$ or $7^{th}$day post stroke for a duration of fourteen days.

Motor recovery was assessed using the STREAM scale –mobility component. This was analysed using the 't' tests. The results showed significant motor recovery in both the groups, the early training group having shown a better improvement.

From this study I conclude, that early bed activity training for hemiplegic subjects had a beneficial and not harmful effect in the acute stage of stroke. Thus this may be a simple and effective intervention, which will bring about early and better motor recovery acute hemiplegic subjects.

# *Limitations and suggestions*

# 8. LIMITATIONS AND SUGGESTIONS

**LIMITATIONS:**

- Sample size was smaller.
- Activities of daily living was not considered.
- Follow up was not done.
- No groups were no treatment was not given.
- Duration of study was very short.
- Study was done only on middle cerebral artery ischemic stroke.
- Hemorrhagic stroke patients were not included in the study.
- Two weeks was not enough to find out the functional outcome.

**SUGGESTIONS:**

- Larger population can be included in this study.
- Along with motor recovery, motor function can also be considered and assessed.
- Study can be done as long term study.
- More outcome measures can be used to confirm the improvement.

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# *Appendices*

# APPENDIX I

## INFORMED CONSENT TO PARTICIPATE IN THE RESEARCH STUDY

I _____ voluntarily consent to participate in the research study **“EFFECT OF EARLY BED ACTIVITY TRAINING AMONG ACUTE HEMIPLEGIC SUBJECTS ON THEIR BASIC MOBILITY”.**

The researchers have explained about the research in brief, the risk of participation and has answered the questions related to the research to my satisfaction.

**Signature of the subject:** **signature of the researcher:**

**Signature of the witness:**

# APPENDIX II (STREAM SCALE – BASIC MOBILITY COMPONENT)

| 3 | 2 | 1c | 1b | 1a | 0 | |
|---|---|---|---|---|---|---|
| | | | | | | 1.ROLLS ONTO SIDE(starting from supine)<br>"rolls onto your side"<br>Note: may roll onto either side; pulling with arms to turn over or aid(score 2) |
| | | | | | | 2. RAISES HIPS OFF BED IN CROOK LYING ( BRIDGING)<br>"lift your hips as high as you can"<br>Note: therapist may stabilize foot , but if knee pushes strongly into extension with bridging with marked deviation(score 1a or 1c) ;if requires aid(external or from therapist) to maintain knees in midline or aid(score 2) |
| | | | | | | 3. MOVES FROM LYING SUPINE TO SITTING(with feet on the floor)<br>"sit up and place your foot on the floor"<br>Note: may sit up to either side using any functional and safe method; longer than 20 seconds with marked deviation (score 1a or 1c); pulling up using bed rail or edge of plinth with aid(score 2) |
| | | | | | | 4. RISES TO STANDING FROM SITTING<br>"stand up; try to take equal weight on both legs"<br>Note: pushing up with hand(s) to stand with aid (score 2) ;asymmetry such as trunk lean, Trendelenburg position, hip retraction, or excessive flexion or extension of the affected knee or marked deviation (score 1a or 1c) |
| | | | | | | 5. MAINTAINS STANDING FOR 20 COUNTS<br>"stand on the spot while I count to twenty" |
| | | | | | | 6. PLACES AFFECTED FOOT ONTO FIRST STEP(or stool 18 cm height)<br>"lift your foot and place it onto the first step(or stool) in front of you"<br>Note: returning the foot to the ground is not scored; use of hand rail or aid (score 2) |
| | | | | | | 7. TAKES 3 STEPS BACKWARDS(one and a half gait cycles)<br>"take 3 average sized steps backwards, placing one foot behind the other" |
| | | | | | | 8. TAKES 3 STEPS SIDEWAYS TO AFFECTED SIDE<br>"take average sized steps sideways towards your weak side" |
| | | | | | | 9. WALKS 10 METERS INDOORS(on smooth obstacle free surface)<br>"walk in a straight line over to ….(a specific point ten meters away)"<br>Note: orthotic or aid (score 2) ;longer than 20 seconds with marked deviation (score 1a or 1c) |
| | | | | | | 10. WALKS DOWN 3 STAIRS ALTERNATING FEET<br>"walk down 3 stairs; place only one foot at a time on each step if you can"<br>Note: handrail or aid(score 2 ); non alternating feet or marked deviation(score 1a or 1c) |

**STREAM SCORING**

| | |
|---|---|
| **0** | Unable to perform the test activity through any appreciable range(minimal active participation) |
| **1a** | Able to perform only part of the activity independently(requires partial assistance or stabilisation to complete), with or without aid, and marked deviation from normal pattern |
| **b** | Able to perform only part of the activity independently(requires partial assistance or stabilisation to complete), with or without aid .but with a grossly normal movement pattern |
| **c** | Able to perform only part of the activity independently, with or without aid, but only with marked deviation from normal pattern |
| **2** | Able to complete the activity independently, with a grossly normal movement pattern, but requires an aid. |
| **3** | able to complete the activity independently, with a grossly normal movement pattern, without an aid |
| **✗** | Activity not tested (specify why: ROM, Pain , other reasons) |

# APPENDIX III

## FUNCTIONAL BALANCE GRADES

**NORMAL –** Patient able to maintain steady balance without handhold support (static). Patient accepts maximal challenge and can shift weight easily within full range in all directions (dynamic).

**GOOD**- Patient able to maintain balance without handhold support limited postural sway (static). Patient accepts moderate challenge; able to maintain balance while picking object off floor (dynamic).

**FAIR**- Patient able to maintain balance with handhold support; may require occasional minimal assistance (static). Patients accepts minimal challenge; able to maintain balance while turning head /trunk (dynamic).

**POOR** – Patient requires hand hold support and moderate to maximal assistance to maintain position (static). Patient unable to accept challenge or move without loss of balance (dynamic).

# APPENDIX IV

## BRUNNSTROM SEQUENTIAL RECOVERY STAGES IN HEMIPLEGIA

**STAGE 1** – Recovery from hemiplegic occurs in a stereotyped sequence of events that begins with a period of flaccidity immediately following the acute episode. No movement of the limbs can be elicited.

**STAGE 2** – as recovery begins, the basic limb synergies or some of their components may appear as associated reactions, or minimal voluntary movement responses may be present. At this time spasticity begins to develop.

**STAGE 3** – Thereafter the patient gains voluntary control of the movement synergies, although full range of all synergy components does not necessarily develop. Spasticity has further increased and may become severe.

**STAGE 4**–Some movement combinations that do not follow the paths of either synergy are mastered, first with difficulty, then with more ease, and spasticity begins to decline.

**STAGE 5** – If progress continues, more difficult movement combinations are learned as the basic limb synergies lose their dominance over motor acts.

**STAGE6** – With the disappearance of spasticity, the individual joint movements become possible and coordination approaches normal. From here on, as the last recovery step, normal motor function is restored, but this last stage is not achieved by all, for the recovery process can plateau at any stage.

# APPENDIX V

## DATA PRESENTATION

| STREAM SCORE- MOBILITY COMPONENT<br>Group I experimental group | | |
|---|---|---|
| Si no | Pre test | Post test |
| 1 | 3 | 17 |
| 2 | 1 | 11 |
| 3 | 2 | 17 |
| 4 | 3 | 16 |
| 5 | 3 | 16 |
| 6 | 1 | 15 |
| 7 | 3 | 17 |
| 8 | 5 | 19 |
| 9 | 3 | 17 |
| 10 | 3 | 15 |

| STREAM SCORE- MOBILITY COMPONENT<br>Group II control group | | |
|---|---|---|
| Si no | Pre test | Post test |
| 1 | 2 | 11 |
| 2 | 1 | 9 |
| 3 | 5 | 14 |
| 4 | 2 | 14 |
| 5 | 3 | 15 |
| 6 | 4 | 12 |
| 7 | 3 | 14 |
| 8 | 1 | 15 |
| 9 | 2 | 17 |
| 10 | 3 | 15 |

# APPENDIX VI

## Assessment form

Name: Bed No.

Age:

Gender:

IP number:

Artery & side involvement:

Onset of symptoms:

Date and time of admission:

Date of assessment:

Level of consciousness:

Communication:

Vital signs:

Stream scale – mobility component

| | Pre test | Post test |
|---|---|---|
| 1. Rolls on to side | …… | …… |
| 2. Raises hips off bed in crook lying | …… | …… |
| 3. Moves from lying supine to sitting | …… | …… |
| 4. Rises to standing from sitting | …… | …… |
| 5. Maintains standing for 20 counts | …… | …… |
| 6. Places affected foot on to first step | …… | …… |
| 7. Takes three steps backwards | ……. | ……. |
| 8. Takes three steps side ways to affected side | ……. | ……. |
| 9. Walks 10 meters indoors | ……. | ……. |
| 10. Walks down 3 stairs alternating feet | ……. | ……. |